

What is claimed:

42. A multi-point seat belt for increasing survival chance of a passenger of a transport system in an accident or during in-flight turbulence, comprising

5 a first and second shoulder belt portion, a lap belt portion and an extending belt portion (1.1 to 1.4) and a first and second belt end (ER) and (EL), where the extending belt portion (1.4), having the second belt end (EL), loosely guided by a shoulder-belt-portion deflector (5, 5b, 12) and equipped with a belt retractor (13), having a clamping device, is attached to a stiff third transport-system member, generally representing a floor of the transport
10 system adjacent to a second seat-side or a seat-backrest frame at the second seat-side or a post section of a motor vehicle adjacent to the second seat-side ;

a main buckle assembly (9.1) having a master release button (84) and attached to a stiff first transport-system member, generally representing the floor of the transport system adjacent to a first seat-side or a seat-cushion frame at the first seat-side or a mid-tunnel of a motor
15 vehicle adjacent to the first seat-side;

at least two latch plates (2, 2a, 9, 11, 25), the first of which is a main latch plate (9), moveable either along the lap belt portion (1.3) or along the second shoulder belt portion (1.2), and the second of which is a shoulder latch plate (2, 2a) of the first belt end (ER) of the first shoulder belt portion (1.1);

20 a lower belt deflector (17), deflecting and loosely guiding the lap belt portion (1.3) or the first shoulder belt portion (1.1) and attached to a stiff second transport-system member, generally representing the floor of the transport system adjacent to the second seat-side or the seat-cushion frame at the second seat-side or the post section of the motor vehicle adjacent to the second seat-side or a side rail of the motor vehicle adjacent to the second
25 seat-side; and

at least one upper buckle assembly (4, 4b, 4c, 4e, 14, 14a, 18, 18a, 18b, 18.1 to 18.3), located on the seat backrest at the first seat-side;

whereby

30 a lower part of the body (96) of the passenger and an upper part of the body (95) are restrained by the lap- and second shoulder belt portions (1.3, 1.2) when the main latch plate (9) is plug-in connected to the main buckle assembly (9.1); and

the upper part of the body is restrained by the first and second shoulder belt portions, both (1.1, 1.2) extending crosswise in an X-shape when the shoulder latch plate (2, 2a) is plug-in connected to the upper buckle assembly.

43. The multi-point seat belt according to claim 42, wherein the master release button (84),
5 when depressed, releases all the latch plates from the respective buckle assemblies.

44. The multi-point seat belt according to claim 43, wherein the master release button (84) is provided with release cables (4.2) connecting to release buttons of the upper buckle assemblies.

45. The multi-point seat belt according to claim 43, wherein the master release button (84) is
10 provided with release wires connecting to electrical release-motors (4.2b) of release buttons of the upper buckle assemblies.

46. The multi-point seat belt according to claim 42, wherein the multi-point seat belt (1, 1a to 1d) consists of a three-point seat belt (1e) and an upper first shoulder belt (1.12a),
15 a first belt end of which and a second belt end are provided with a transition buckle assembly (4e) and the shoulder latch plate (2a), plug-in connected to the upper buckle assembly; and a transition latch plate (2) is attached to a first belt end of a lower first shoulder belt portion (1.11) of the three-point seat belt (1e);

whereby

20 the passenger is restrained when the main latch plate (9) and the transition latch plate (2) are plug-in connected to the main buckle assembly (9.1) and the transition buckle assembly (4e), where the lower first shoulder belt portion (1.11) projects through the lower belt deflector (17) at a sufficient length (l₁) needed for the belt retractor to retract the first shoulder belt portion (1.1), defined by the lower first shoulder belt portion (1.11) and the upper first shoulder belt (1.12a), in the accident.

25 47. The multi-point seat belt according to claim 42, wherein the multi-point seat belt (1, 1a to 1d) consists of a three-point seat belt (1e) and an upper first shoulder belt (1.12), a first belt end of which is provided with a transition buckle assembly (4e), having a transition release button (84c), acting as the upper buckle assembly (4) and located in a home position on a seat-backrest aperture of the seat backrest at the first seat-side, and a second
30 belt end is arranged to the seat-backrest frame at the first seat-side; and

a transition latch plate (2) is attached to a first belt end of a lower first shoulder belt portion (1.11) of the three-point seat belt (1e);

whereby

in a coupling position the passenger is restrained when the main latch plate (9) and the
5 transition latch plate (2) are plug-in connected to the main buckle assembly (9.1) and the
transition buckle assembly (4e), pulled out from the seat-backrest aperture, where through
a transition portion of the upper first shoulder belt is projected, where the lower first
shoulder belt portion (1.11) projects through the lower belt deflector (17) at a sufficient
length (l₁) needed for the belt retractor to retract the first shoulder belt portion (1.1),
10 defined by the lower first shoulder belt portion (1.11) and the upper first shoulder belt
(1.12), in the accident.

48. The multi-point seat belt according to claim 47, wherein the second belt end of the upper
first shoulder belt (1.12) is provided with a second belt retractor (13a), arranged in the seat
backrest (3.2) at the first seat-side, and having a spring force, which is less than that of the belt
15 retractor (13);

whereby

in the coupling position the belt retractor pulls the upper first shoulder belt out from the
second belt retractor through the seat-backrest aperture or

in the home position the transition buckle assembly (4e), released by depressing the transition
20 release button, is pulled by the second belt retractor until being located on the seat-
backrest aperture.

49. The multi-point seat belt according to claim 48, wherein the transition buckle assembly is
provided with an electrical release-motor (4.2b), which, when receiving an electrical signal
from the main buckle assembly resulting from depressing the main release button releasing the
25 main latch plate, pulls the transition release button to release the transition latch plate.

50. The multi-point seat belt according to claim 42, wherein the lower belt deflector (17)
comprises a housing, having an attachment hole, and a pin (17.1), attached in the housing to
form an aperture which loosely retains the released shoulder latch plate (2, 2a).

51. The multi-point seat belt according to claim 50, wherein the pin (17.1) is surrounded by
30 a sleeve (17.2).

52. The multi-point seat belt according to claim 51, wherein the lower belt deflector (17) is made from one piece.

53. The multi-point seat belt according to claim 43, wherein the released shoulder latch plate is plug-in connected to an assisting buckle assembly (16, 16a, 16b), having an easily-
5 accessible release button and attached to a seat, where the passenger, wanting to use the multi-point seat belt, depresses the easily-accessible release button to release and access the shoulder latch plate.

54. The multi-point seat belt according to claim 43, wherein the released shoulder latch plate is plug-in connected to an assisting buckle assembly (16, 16a, 16b), having an easily-
10 accessible release button and attached to the post section, where the passenger, wanting to use the multi-point seat belt, depresses the easily-accessible release button to release and access the shoulder latch plate.

55. The multi-point seat belt according to claim 43, wherein a belt-feeding device (20a, 20b) consists of

15 a belt housing (20.4a), to which the shoulder latch plate (2, 2a) of the first shoulder belt portion (1.1) is attached; and
an operating arm (20.2a), to a first end of which and a second end are connected to the belt housing and a guide tube (20.1), pivotally attached in a supporting tube of the seat backrest;

20 whereby the shoulder latch plate (2, 2a) is inserted into and connected to the upper buckle assembly (4, 14, 18) and the first shoulder belt portion is moved from a resting position at the second seat-side to an operative position at the first seat-side by a rotatory movement of the operating arm.

25 56. The multi-point seat belt according to claim 55, wherein the belt-feeding device (20a, 20b) is provided with at least one drive apparatus to rotate the operating arm, where the shoulder latch plate (2, 2a) is inserted into and connected to the upper buckle assembly (4, 14, 18) and the first shoulder belt portion is moved from the resting position at the second seat-side to the operative position at the first seat-side by a rotatory movement of the operating arm when the drive apparatus is activated.

57. The multi-point seat belt according to claim 56, wherein the operating arm (20.2a) consists of

a horizontal portion, to an end of which the guide tube is fastened; and

a vertical portion, an end of which is fastened to the belt housing, having a vertical tube with
5 two openings, facing each other, which is moveable along the vertical portion to adjust a height of the belt housing.

58. The multi-point seat belt according to claim 57, wherein a radial-adjustable tube (20.3) is attached between the horizontal portion and the guide tube, where the first shoulder belt portion is moved from the resting position to the operative position by a radial-adjusting
10 movement of the radial-adjustable tube when the drive apparatus is activated.

59. The multi-point seat belt according to claim 56, wherein the drive apparatus is operable to return the first shoulder belt portion (1.1) from the operative position to the resting position, when a dwell time, predetermined for inserting the main latch plate (9) into the main buckle assembly (9.1), is exceeded.

60. The multi-point seat belt according to claim 56, wherein the drive apparatus returns the first shoulder belt portion (1.1) from the operative position to the resting position, when a dwell time, predetermined for inserting the shoulder latch plate (2, 2a) into the upper buckle assembly (4, 4a to 4c, 14, 14a, 18), is exceeded.

61. The multi-point seat belt according to claim 56, wherein the drive apparatus, activated in response to activating a switch, attached in the main buckle assembly (9.1), upon contact with
20 a cam of the main latch plate (9), when inserted therein, is switched off when the operative position is reached.

62. The multi-point seat belt according to claim 56, wherein the drive apparatus, activated in response to starting an engine of the transport system, is switched off when the operative
25 position is reached.

63. The multi-point seat belt according to claim 56, wherein the drive apparatus, activated in response to closing a vehicle door of the transport system, is switched off when the operative position is reached.

64. The multi-point seat belt according to claim 56, wherein the drive apparatus, activated in response to actuating a switch, is switched off when the operative position is reached.
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65. The multi-point seat belt according to claim 56, wherein the drive apparatus is activated when the passenger takes a seat, where to a sensor is built, where the drive apparatus is switched off when the operative position is reached.

66. The multi-point seat belt according to claim 56, wherein the drive apparatus, activated in response to depressing x-times the master release button (84), is switched off when the operative position is reached.

67. The multi-point seat belt according to claim 56, wherein the master release button (84) is provided with

release wires connecting to electrical release-motors (4.2b) of release buttons of the upper

buckle assemblies and

a release wire connecting to the drive apparatus;

where the master release button, when depressed, releases all the latch plates from the respective buckle assemblies and returns the belt-feeding device to the resting position.

68. The multi-point seat belt according to claim 42, wherein the supplemental latch plate is a belt-detachable latch plate (25), which has a quick-release pin (25.1) and a U-shaped portion to house the belt portion of the seat belt which is secured therein by the quick-release pin and detached therefrom by pulling it.

69. The multi-point seat belt according to claim 68, wherein the seat backrest at the second seat-side is provided with supplemental upper buckle assemblies (19, 19a, 19b, 19.1 to 19.3), which together with the corresponding supplemental upper buckle assemblies at the first seat-side define the pairs of supplemental upper buckle assemblies (18 / 19, 18a / 19a, 18b / 19b, 18.1 / 19.1 to 18.3 / 19.3),

one of which is adapted to a small body proportion of the passenger, lower than the upper buckle assembly; and,

finally, the belt-detachable latch plates, housing both shoulder belt portions, are plug-in connected to that pair.

70. The multi-point seat belt according to claim 69, wherein the belt-detachable latch plates, when not being used, are stored and secured in a storage box (25.5) of the seat.

71. The multi-point seat belt according to claim 69, wherein the buckle assembly is provided with a coupling fitting (1.2a, 1.2b) to receive vibration-dampening energy absorbers.

72. The multi-point seat belt according to claim 56, wherein a belt-catching member (20.7, 20.7a) is attached to the seat backrest to intercept and hold at least one shoulder belt portion when being in the resting position.

73. The multi-point seat belt according to claim 43, further comprising a height- and width-
5 adjusting mechanism (27) consisting of

a pair of tubes (27.1) of a seat backrest frame (3.4d) having a plurality of vertical locking slots, one pair of which is engaged with a locking handle (27.5), that is pulled to detach therefrom and released to engage with another pair, when adjusting to a height of a body proportion of the passenger;

10 a frame (29) consisting of a pair of outer frame-tubes (27.2), moveable along the inner frame-tubes (27.1), a connecting member of all frame-tubes (27.2, 27.3) and a pair of outer tubes (27.3), in which inner tubes (27.4) are moveable, biased by tube-springs (27.6) and form- and force-locking connected to the locking handle (27.5), where the tube-spring (27.6) on a sleeve (27.7), secured by a pin (27.8), protruding through holes of the inner
15 tube (27.4), presses against a spring rest (27.9) of the outer tube (27.3);

a plurality of horizontal locking slots arranged along one of the outer tubes (27.3); and
at least one buckle-assembly unit (18.3, 19.3), consisting of an upper buckle assembly (4c),
to connect to the shoulder latch plate, and a housing (18.12), form-locking connected to
the upper buckle assembly, moveable along the outer tubes (27.3) and secured by a pawl
20 (18.10) biased by a pawl-spring (18.5), engaged with the horizontal locking slot (r) and
detached therefrom by pulling the pawl to adjust to a width of the body proportion.

74. The multi-point seat belt according to claim 1, wherein the multi-point seat belt (1, 1a to 1d), having a property of limited energy absorption (70, 80), is provided with sites of predetermined fracture having threshold values.

25 75. The multi-point seat belt according to claim 74, wherein the sites of predetermined fracture have different threshold values.

76. The multi-point seat belt according to claim 75, wherein the different threshold values are determined by different number of overlapped belt portions.

77. The multi-point seat belt according to claim 75, wherein the different threshold values
30 are determined by seam stitches having different width.

78. The multi-point seat belt according to claim 75, wherein the different threshold values are determined by yarns having different yield strength.

79. The multi-point seat belt according to claim 75, wherein the different threshold values are determined by seams made from yarn sewn in different number of rows.

5 **80.** The multi-point seat belt according to claim 1, wherein a Vehicle Identification Number (**81**), arranged on a surface of an engraved belt portion of the seat belt, is concealed from unauthorized persons, intending to manipulate, when this surface is covered by a covering belt portion and both belt portions are sewn together.

10 **81.** The multi-point seat belt according to claim 80, wherein a manufacturing date, added to the Vehicle Identification Number (**81**), is arranged on the surface of the engraved belt portion thereof.